

ON THE GENUS PHLEBOTOMUS.—PART IV.

By R. NEWSTEAD, F.R.S.,

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The following notes may be regarded chiefly as materials towards the study of the geographical distribution of this group of the bloodsucking midges, which are of so much interest from a medical standpoint. For the opportunity of examining the very large series of specimens (570) herein recorded, I have to thank Dr. Guy A. K. Marshall, Director of the Imperial Bureau of Entomology, who sent the collections made by Drs. A. Ingram and J. W. Scott Macfie, in the Gold Coast; and also that formed by Capt. J. Waterston, R.A.M.C., in Macedonia. I tender my thanks also to Capt. P. A. Buxton, R.A.M.C., for the collections made by him at Amara, Mesopotamia; to Capt. H. W. Leatham, R.A.M.C., for examples from Basra; and to Major J. A. Sinton, V.C., I.M.S., for the specimens which he collected in N.E. Persia, under exceptionally difficult circumstances, and also for the long series taken by him in the N.W. Frontier Province of India.

I may add to this short communication that the determinations of the specimens herein recorded are based upon material which was carefully prepared and stained for microscopical examination, as by this means the minute taxonomic characters can be seen and studied with greater accuracy and ease.

Phlebotomus antennatus, Newstead.

Male (hitherto unknown). *Pale form*. Drab or straw-coloured; fringe of costa, anteriorly, rather strongly infuscated, that of the posterior margin not so. Hairs

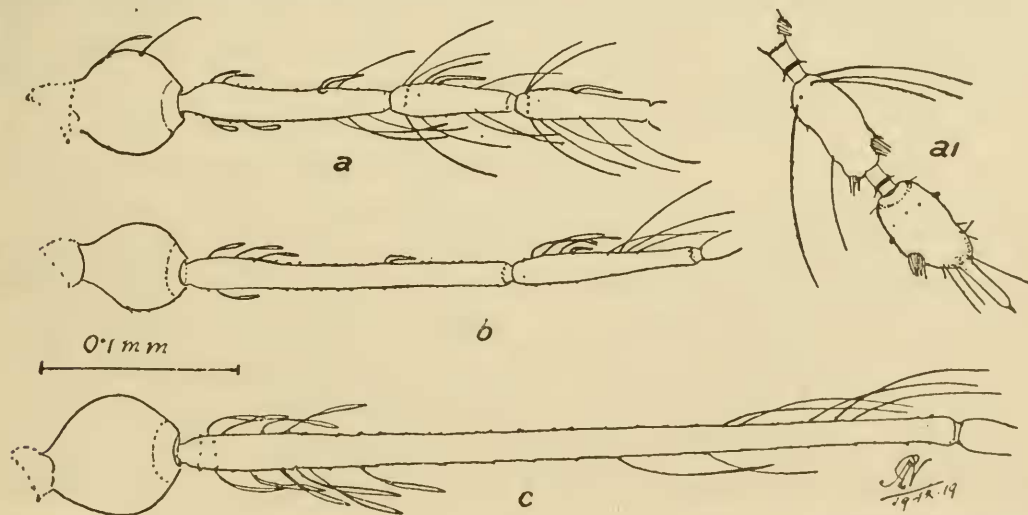


Fig. 1. *Phlebotomus antennatus*, Newst., ♂; *a*, proximal segments of the antenna; *a*₁, terminal segments. *P. minutus africanus*, Newst., ♂: *b*, proximal segments of antenna. *P. simillimus*, Newst., ♂: *c*, proximal segments of antenna. The figures *a*, *b*, and *c* are drawn to the same scale; *a*₁, at a much higher magnification.

on wings and scales on legs very faintly iridescent in a strong light. *Dark form*. Wing very heavily infuscated, especially the costal fringe on both margins; the hairs beautifully iridescent, and in certain lights strongly resembling the rich deep blue of lapis-lazuli. The scales of the legs are also iridescent in certain lights,

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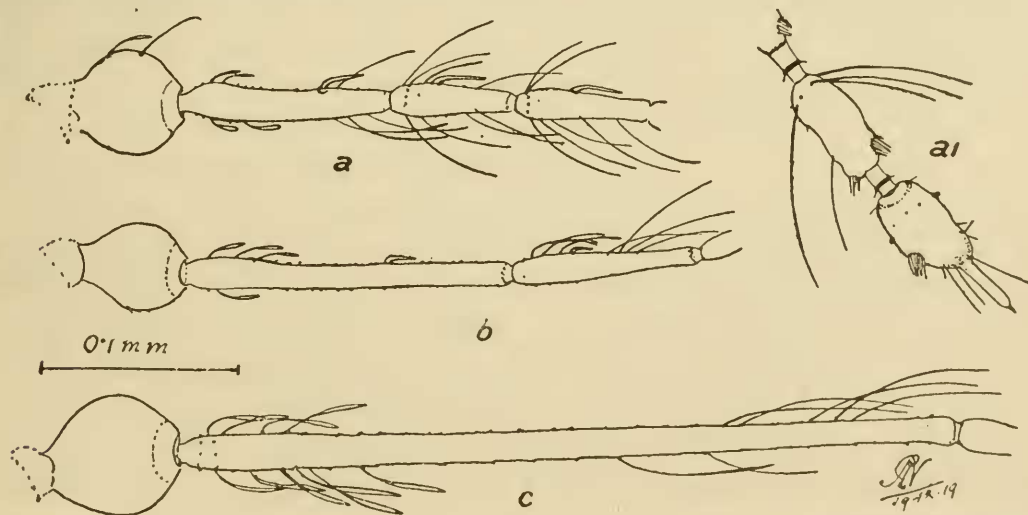


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the predominant blue colour being almost as intense as that of the wings. Hairs on the proximal segment of the abdomen erect; those on the remaining segments recumbent. Antennae with the segments (fig. 1, *a*) only very slightly longer than those of the female; the geniculated spines unilateral* and unpaired. Wing rather narrowly lanceolate. External armature precisely similar to that of *P. minutus*, Rond.

Length, 2–2.4 mm.; wing 1.2 mm.; leg iii, 2 mm.

GOLD COAST: Accra, in laboratory. vi. 19, 38 ♂♂, 59 ♀♀ (*Dr. J. W. Scott Macfie*); Kwaman, 10.viii.18, 1 ♀; Navarro, on walls of M.O's. quarters, 22.vi.18, 1 ♀; Yamalaga, 18.v.18, 1 ♀; Salaga, on walls of M.O's. quarters, 10.v.18, 1 ♀; Yeji, 6.v.18, 1 ♀ (*Dr. A. Ingram*).

***Phlebotomus ingrami*, Newstead.**

GOLD COAST: Chechewere, 9.viii.18, 1 ♂ (*Dr. A. Ingram*).

***Phlebotomus minutus*, Rondani.**

MACEDONIA: near Salonica, 1918, 1 ♂, 1 ♀ (*Capt. J. Waterston*). MESOPOTAMIA: Amara, River Tigris, 1.ix.18, 1 ♂, 20 ♀♀ (at light); 8.ix.18, 2 ♂♂, 5 ♀♀ (at light); 19.ix.18, 1 ♀; 30.ix.18, 1 ♂, 9 ♀♀ (at light); 1.x.18, 2 ♀♀; 14.x.18, 1 ♂ (at light) (*Capt. P. A. Buxton*). INDIA: N.W. Frontier Province, Dera Ismail Khan, viii. 1919, 33 ♂♂, 34 ♀♀ (*Major J. A. Sinton, V.C.*).

***Phlebotomus minutus africanus*, Newst.**

GOLD COAST: Yeji, 6.v.18, 1 ♀; Malowe, 29.vii.18, 1 ♂, 2 ♀♀; Accra, 4.i.19, 2 ♂♂, 1 ♀; Lilixia, 4.vii.18, 3 ♂♂, 3 ♀♀; Diari, on Rest House wall, 26.v.18, 1 ♀; Gambaga, in latrine, 1.vi.18, 7 ♂♂, 1 ♀; 5.vi.18, 1 ♀ inside mosquito net; Salaga, on walls of M.O's. quarters, 10.v.18, 6 ♂♂, 3 ♀♀; Jugbe, 1.viii.18, 1 ♀; Sekodumase, 8.viii.18, 2 ♂♂, 11 ♀♀; Tili, on walls of Rest House, 14.vi.18, 2 ♂♂, 1 ♀; Nangudi, on walls of Rest House, 15.vi.18, 3 ♂♂, 7 ♀♀; Kulmasa, 22.vii.18, 1 ♀; Nandawli, 15.vii.18, 2 ♂♂, 4 ♀♀; Bole, 26.vii.18, 1 ♂; Chechewere, 9.viii.18, 1 ♂, 3 ♀♀; Bawku, 12.vi.18, inside mosquito net, 3 ♀♀; Savelugu, Rest House, 25.v.18, 2 ♂♂, 2 ♀♀; Wa, Rest House, 20.vii.18, 1 ♀; Navarro, on walls of M.O's. quarters, 22.vi.18, 2 ♂♂, 4 ♀♀; Bawku, on walls of quarters formerly belonging to M.O., 10.vi.18, 5 ♂♂, 1 ♀; Banda Nkwanta, 30.vii.18, 2 ♂♂, 6 ♀♀; Maibindiga, on walls of Rest House, 31.v.18, 2 ♀♀; Palbe, 16.v.18, 1 ♀; Kwaman, 10.viii.18, 1 ♀; Zovaragu, on walls of D.C's. quarters, 16.vii.18, 1 ♂, 2 ♀♀; Tishi, on walls of Rest House, 1.vi.18, 1 ♂, 1 ♀; Kpalgu, on walls of Rest House, 30.v.18, 1 ♀; Yamalaga, 18.v.18, 1 ♀ (*Dr. A. Ingram*); Accra, in laboratory, vi.19, 3 ♂♂, 4 ♀♀ (*Dr. J. W. Scott Macfie*).

***Phlebotomus papatasi* (Scopoli).**

MESOPOTAMIA: 30.vi.18, 1 ♂, 3 ♀♀; Amara, River Tigris, 14.vi.18, 1 ♀; viii.18, 1 ♂, 5 ♀♀; 2.ix.18, 3 ♀♀ (biting man); 21.ix.18, 1 ♂ (*Capt. P. A. Buxton*). MACEDONIA: near Salonica, 1918, 14 ♂♂, 35 ♀♀ (*Capt. J. Waterston*). INDIA: N.W. Frontier Province, Dera Ismail Khan, viii. 1919, 3 ♂♂, 3 ♀♀ (*Major J. A. Sinton, V.C.*). ASIA MINOR: Trebizond, 5 ♂♂, 3 ♀♀ (*Dr. B. Uvarov*).

* This rather remarkable character is common also to the males of the following species: *P. minutus*, Rond., *P. minutus africanus*, Newst., and *P. simillimus*, Newst. (see fig. 1 *b, c*).

Phlebotomus perniciosus, Newstead.

MACEDONIA: near Salonica, 1918, 26 ♂♂, 9 ♀♀ (*Capt. J. Waterston*). CAUCASIA: Borzham, Province of Tiflis, 16.viii.1919, 8 ♂♂, 3 ♀♀ (*Dr. Kandelaki*, per *Dr. B. Uvarov*).

Phlebotomus sergenti, Parrot.

Phlebotomus sergenti, Parrot, Bull. Soc. Path. Exot. x, pp. 564–567, figs. 1–11 (1917).

Phlebotomus caucasicus, Marzinovsky, Medical Review, Moscow, lxxxvii, nos. 13–14–15–16, pp. 612–614 (1917).

A large species somewhat resembling *P. papatasi* (Scop.) in colour and in the general arrangement of the body hairs. But the male of *P. sergenti* is abundantly distinct and may be recognised from all other species by the unique character of the genitalia, in which the great length of the sub-proximal spine on the superior claspers should serve at once to distinguish it from all the species possessing paired brushes (*peniculi*) of non-deciduous hairs between the superior claspers proximally. On the other hand, it is extremely difficult to give taxonomic characters for the separation of the female from that of *P. papatasi*. In a typical example of *P. sergenti*, generously presented to me by M. Parrot, I fail to find any structural difference by which it could be separated from the ♀ of *P. papatasi*, though it is decidedly smaller; and this applies also to the female of the variety herein described from Mesopotamia. In the females from Persia, however, the geniculated spines of the antennae are slightly longer than those on the corresponding segments in the African examples before me; and in one example the spines are also accompanied by a somewhat lunular-shaped, subcutaneous structure (? gland), which no staining has hitherto revealed in any of my preparations. On the other hand, the males from the two widely separated regions agree in all their morphological details and are clearly conspecific. There is, I think, no doubt also that the African and Caucasian species are one and the same.

Marzinovsky (*l.c.*) notes the close affinity of his *P. caucasicus* with *P. sergenti*, Parrot, but claims that it is distinguished from the latter in some details. These "details" are, however, not traceable either in his diagnosis or in his figure of the male genital armature. Thanks to Col. C. M. Wenyon I have been able to study a direct photographic print of the male genital armature taken from the original negative which was used by Marzinovsky in illustration of his paper, and this confirms my views as to the specific identity of the Caucasian with the African form.

The following description is based upon material collected in N.E. Persia by Major J. A. Sinton, V.C. :—

Male.—Palpi of five segments; 2nd and 4th about equal in length; the 3rd a little longer than the 2nd, laterally incrassate, the incrassation seen only in dorso-ventral view; sensorium well marked by the relatively large clubbed hairs; 5th a little more than twice the length of the 4th. Antennae with the distal end of the 3rd segment almost reaching to the tip of the proboscis; the tips of the paired geniculated spines on segments 3–15, inclusive, reaching a point very slightly in advance of the centre of all the segments with the exception of the 3rd. Wing

(fig. 2, *a*) somewhat lanceolate, the tip rather acutely pointed. Genital armature (fig. 2, *b*) with a pair of relatively large brushes or peniculi between the superior claspers proximally. Proximal segment of superior claspers very robust; distal segment about half the length of the first, strongly bifurcated distally, the tip of each

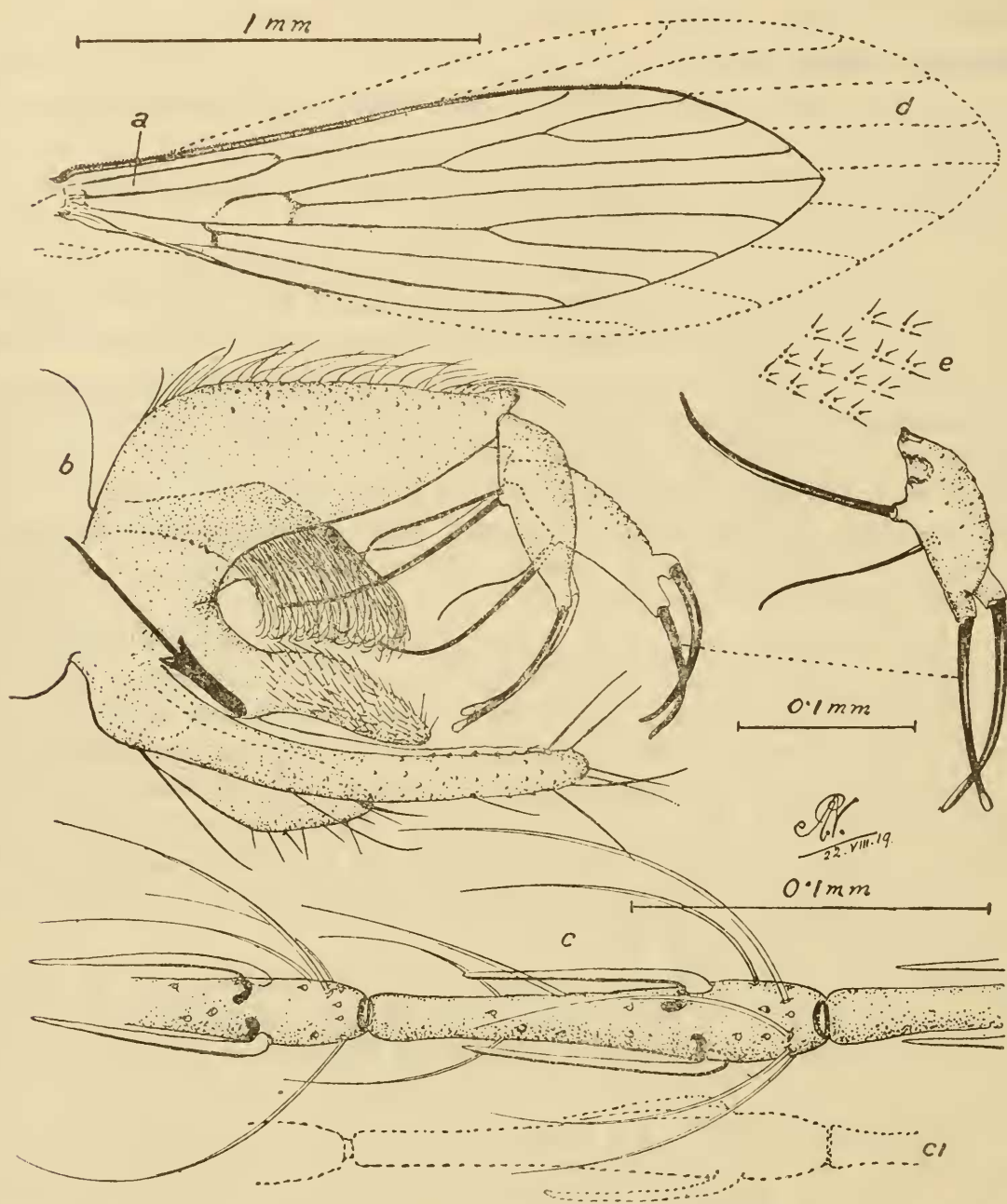


Fig. 2. *Phlebotomus sergenti*, Parrot: *a*, wing of ♂; *b*, genital armature of ♂; *c*, sixth segment of antenna of ♀, showing relative length of the geniculated spines and subcutaneous structures (? glands) near the bases of the former; *c*₁, dotted outline of the corresponding segment in *P. papatasi*; *d*, wing of *P. sergenti* ♀, in dotted outline, drawn to same scale as that of the ♂ (*a*); *e*, connective cuticle between tergites and sternites.

branch with an unusually long stout spine; near the proximal third of the segment is another pair of spines: the outer lateral one stout and of great length, the tip of which reaches almost to the base of the proximal segment of the superior clasper when the latter is closed (see fig. 2, *b*); the inner lateral spine much more slender,

generally curved distally and a little more than half the length of the longer outer one. The long inferior clasper extending beyond the distal end of the proximal segment of the superior clasper by one-fifth of its total length.

Length, 3 mm ; *length of wing*, 1.9 mm.

Female.—General facies similar to that of the male, but larger and generally more robust. Palpi precisely similar to those of the male. Antennae with the tip of the 4th segment extending very slightly beyond the proboscis ; the 3rd segment relatively shorter than the corresponding segment in the male ; the paired geniculated spines (fig. 2, *c*) extending considerably beyond the middle in most of the segments, while those on the 14th and 15th, respectively, extend to the articulation of the succeeding segment ; on many of the segments the spines are accompanied by a relatively large and somewhat lunular-shaped subcutaneous structure (? gland). Wing (fig. 2, *d*) much broader than that of the male, with the hind margin also much more strongly arched. Connective cuticle between the tergites and sternites (fig. 2, *e*) with a very regular diagonal pattern formed by equidistant groups of minute hairs, each group composed of four hairs.

Length, 3.7 mm. ; *length of wing*, 2.4 mm. ; *length of leg ii*, 3.9 mm. ; *length of 3rd segment of antennae*, 0.3 mm.

NORTH EAST PERSIA : Meshed, vi. 1918, 5 ♂♂, 3 ♀♀ (*Major J. A. Sinton, V.C.*).

***Phlebotomus sergenti*, var.**

Male.—Differing from typical *P. sergenti*, Parrot (*l.c.*) in having the 3rd segment of the antennae (fig. 3, *a*) relatively very much shorter and with the distal, bifurcating, spine-bearing process of the superior claspers (fig., 3 *b*) markedly unequal in length, the terminal process being about three times the length of the other.

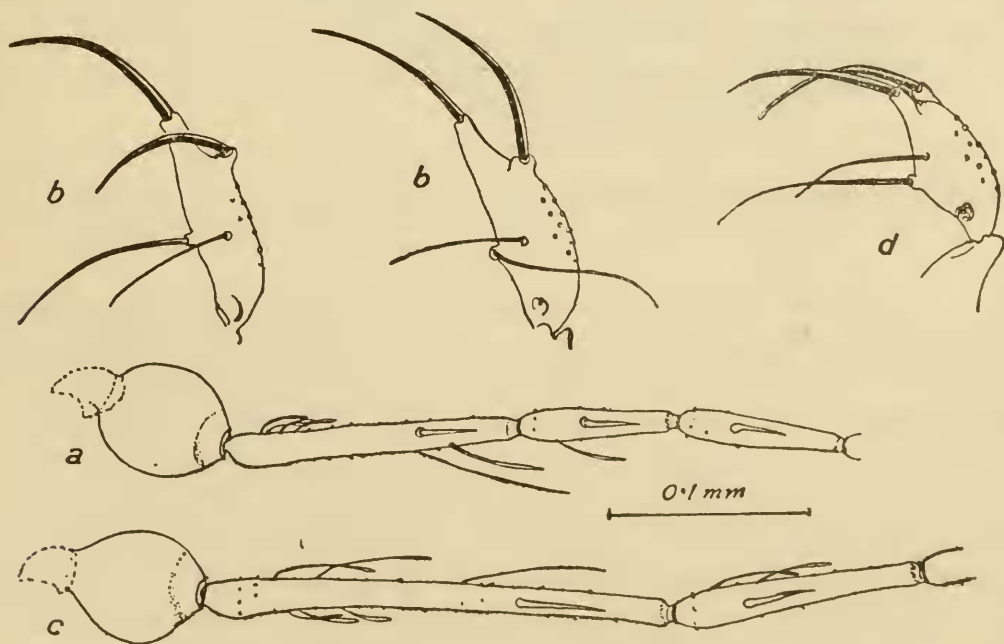


Fig. 3. *Phlebotomus sergenti*, var. ♂ : *a*, proximal segment of the antennae ; *b*, *b*, distal segments of the superior claspers.
Phlebotomus sergenti, Parrot, ♂ : *c*, proximal segments of the antenna ; *d*, distal segment of the superior clasper,
 All the figures are drawn to the same scale.

The 3rd antennal segment (fig. 3, *c*) and the distal segment of the superior clasper (fig. 3, *d*) of *P. sergenti* drawn to the same scale as the corresponding structures in this var. are given for comparison and convenience of reference.

MESOPOTAMIA: Amara, 1 ♂, taken at light, 19.ix.18 (Capt. P. A. Buxton); another ♂ from the same locality, but taken 1.ix.18, has been placed in the National Collection. There are also 6 ♀♀ which I attribute to this variety of *P. sergenti*, though I am not absolutely certain that they belong here; they bear the following data: Amara, River Tigris, 4.vi.18, 1 ♀; Mesopotamia, 30.vi.18, 3 ♀♀; Baqubah, River Diayala, 28.vii.18, 1 ♀; Amara, River Tigris, 18.x.18, 1 ♀ (biting man) (Capt. P. A. Buxton).

***Phlebotomus signatipennis*, sp. nov.**

A small short-legged exceptionally hairy species; easily determined by the strikingly characteristic wing venation, in which the 1st sub-marginal cell is relatively very small indeed, the anterior branch of the vein being about one-fifth the length of the vein between the two forks.

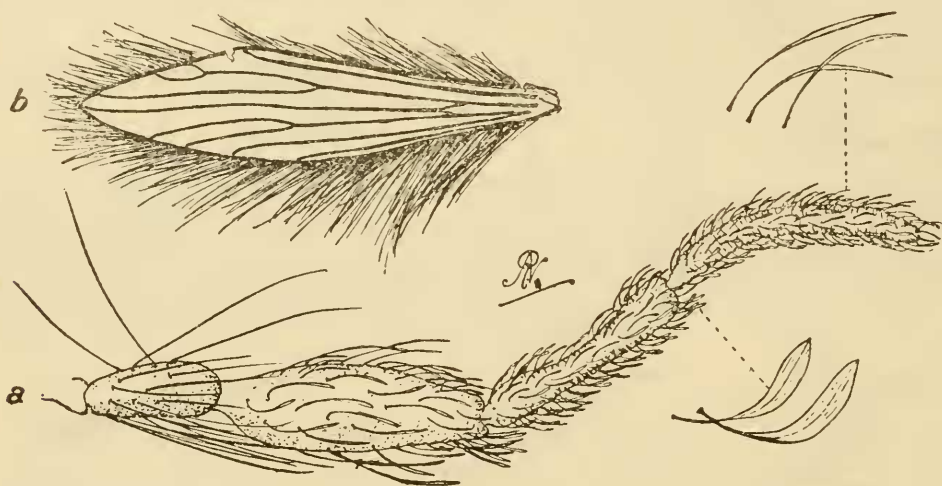


Fig. 4. *Phlebotomus signatipennis*, Newstead, ♀: *a*, palpus; *b*, wing; the latter drawn to the same scale as the wing of *P. sergenti* in fig. 2, *a*.

Female. Relatively robust, short-legged, and exceptionally hairy, the hairs heavily infuscated, more especially those which form the wing-fringe. Hairs on proximal portion of abdomen more or less erect, the longest reaching to the middle of the 4th segment, the rest recumbent on both the tergites and sternites. Leg scales dark leaden grey; hind tibiae with 4–5 long equidistant outstanding hairs. Antennae with relatively short segments, and densely clothed with long hairs. Palpi (fig. 4, *a*) relatively short and robust; 2nd segment rather densely clothed with very long hairs, the longest reaching to about the middle of the succeeding segment; 3rd strongly incrassate and about twice the length of the 2nd; 4th narrower, and a little shorter than the 3rd; 5th relatively very short and about equal in length to the 3rd. Clypeus very short, and widely rounded distally. Wings (fig. 4, *b*) narrowly lanceolate, and distinctly pointed; veins unusually thick; the 1st sub-marginal cell exceptionally small, and placed at a relatively long distance in advance of the tip of the 1st longitudinal vein, the distance

between the two forks of the 2nd longitudinal vein being five times as great as the length of the upper branch of the 2nd fork, hairs forming the fringe dense and of great length, some of them being much longer than the greatest width of the wing. The hairs and scales on all parts of the body are not, apparently, so easily deciduous as in other members of the genus.

Length, 1.6 mm, approximately; *length of wing*, 1.25 mm.

GOLD COAST: Gambaga, in latrine, 1 ♀ (type), 1.vi.18 (*Dr. A. Ingram*).

Phlebotomus simillimus, Newstead.

GOLD COAST: Yamalaga, 18.v.18, 1 ♂, 3 ♀♀; Kpalgu, 30.v.18, 1 ♂; Kukuma, 6.viii.18, 1 ♂, 1 ♀; Maibindiga, on walls of Rest House, 31.v.18, 1 ♂; Nkoranza, 9.viii.18, 2 ♂♂, 10 ♀♀; Kulmasa, 22.vii.18, 1 ♀; Sekodumase, 5 ♀♀ Yeji, 8.viii.18, ; 6.v.18, 1 ♂ (*Dr. A. Ingram*).

Phlebotomus walkeri, Newstead.

Phlebotomus walkeri, Newst., Bull. Ent. Res. v, p. 190 (1914).

Phlebotomus longipalpis, Newst. (*nec* Lutz & Neiva), *ibid.* p. 188.

The species taken by Dr. F. D. Walker on the Abuna River, Bolivia-Brazil Boundary, in 1913, and recorded by me in this Bulletin (*l.c.*) as *P. longipalpis*, Lutz & Neiva, is, as I surmised at the time, clearly distinct and, so far as I can judge, must take specific rank under the alternative name, *walkeri*, suggested by me (*l.c.*).

The males of the two species are easily separable by the characters of the external genitalia: in *P. longipalpis* the small brushes or peniculi are absent, and the four long spines on the distal segment of the superior claspers are arranged as follows: one apical, one sub-apical, and the remaining two placed closely together on opposite sides of the segment in a similar way to the corresponding spines in *P. sergenti* (see fig. 2, *b*); whereas in *P. walkeri* the 4th spine is quite isolated from the others.

I am pleased to be able to clear up the discrepancies to which I had previously called attention, thanks to the generosity of Dr. Lutz, who has very kindly presented me with examples of his *P. longipalpis*.

Phlebotomus sp.

The examples recorded below come very near *P. antennatus*, Newst., and possibly represent a degree of variation in the antennal formula of the females of this species. But pairs taken in coitu are needed before one can state to what extent variation occurs in the females of this and other allied species.

GOLD COAST: Yeji, 6.v.18, 1 ♀; Savelugu, in Rest House, 25.v.18, 1 ♀; Wa, on walls of Rest House, 20.vii.18, 1 ♀; Navarro, on walls of M.O.'s quarters, 22.vi.18, 2 ♀♀; Kwaman, 10.viii.18, 3 ♀♀; Yamalaga, 18.v.18, 2 ♀♀; Salaga, on walls of M.O.'s quarters, 10.v.18, 1 ♀ (*Dr. A. Ingram*).

Phlebotomus sp.

MESOPOTAMIA: Amara, x.18, 1 ♀ (at light); 8.ix.18, 1 ♀ (at light); Amara, River Tigris, 30.ix.18, 1 ♀ (*Capt. P. A. Buxton*).